AN ESTIMATE OF THE MIGRATORY TIMING AND ABUNDANCE OF SOCKEYE SALMON INTO UPPER COOK INLET, ALASKA, IN 1998

By: Kenneth E. Tarbox

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ABSTRACT

During the 1998 Upper Cook Inlet, Alaska commercial salmon fishing season a test fishery was used to estimate the timing of the sockeye salmon *Oncorhynchus nerka*, run as it passed a transect along the southern boundary of the management area. The test fishery operated from 1 July to 30 July and captured 1,576 sockeye salmon representing 1,158 CPUE points. Mean date of the run was 18 July, and the test fishery encompassed approximately 85.6% of the total run.

KEY WORDS: Salmon, *Oncorhynchus*, Upper Cook Inlet, Alaska, test fishery, migratory behavior

INTRODUCTION

In 1979 the Alaska Department of Fish and Game (ADF&G) began a test fishing project near the southern boundary of the Upper Cook Inlet (UCI) salmon management area (Figure1). The objective of this project was to estimate the total run of sockeye salmon *Oncorhynchus nerka,* to UCI before salmon reached commercial harvest areas. Such information has helped ADF&G management biologists set commercial fishing times and areas to harvest sockeye salmon surplus to spawning needs. Test fishing results have been reported annually since 1979 (Waltemyer 1983a, 1983b, 1986a, 1986b, Hilsinger and Waltemyer 1987, Hilsinger 1988, Tarbox and Waltemyer 1989, Tarbox 1990, 1992, 1994, 1995, 1996, 1997, 1998). This report presents the results of the 1998 test fishing project.

METHODS

Test Fishing

Sockeye salmon returning to Upper Cook Inlet were sampled by fishing geographically fixed stations between Anchor Point and Red River Delta (Figure 1). Stations were numbered consecutively from east to west. Station locations were determined from LORAN C coordinates. A chartered test fishing vessel sampled stations 4 - 8 daily.

Sampling started on 1 July and continued through 30 July. The chartered vessel, *F/V Corrina Kay,* fished 366 m (1,200 ft) of 2.1 cm (5 1/8 in) multifilament gill net during test fishing. Drift gill net web had a filament size number of 53/S6F, was 45 meshes deep, and was constructed of double knot Super Crystal shade number 1.

All salmon captured were identified to species. All sockeye salmon were measured for length (mid-eye to fork-of-tail in mm). The number of each species caught at each station was expressed as a catch per unit of effort (CPUE) statistic:

$$CPUE_s = \frac{100 \text{ fm} \times 60 \text{ min} \times \text{number of fish}}{\text{fm of gear} \times \text{MFT}}, \qquad (1)$$

where: $CPUE_s$ = CPUE for station s, and
MFT = mean fishing time.

Mean fishing time was calculated as:

$$MFT = (C - B) + \frac{[B - A] + [D - C]}{2}, \quad (2)$$

where: A = time net deployment started,
B = time net fully deployed,
C = time net retrieval started, and
D = time net fully retrieved.

Once deployed at a station, gill nets were fished 30 min before retrieval started.

Daily CPUE ($CPUE_d$) was calculated as:

$$CPUE_d = \sum_{s=1}^{n} CPUE_s \quad (3)$$

The following physical and chemical measurements were taken at the start of each set: air temperature, water temperature (at 1 m below the surface), wind velocity and direction, tide stage, water depth, and water clarity. Air and water temperatures were measured using a YSI salinity/temperature meter. Wind speed was measured in knots and direction was recorded as 0 (no wind), 1 (north), 2 (northeast), 3 (east), 4 (southeast), 5 (south), 6 (southwest), 7 (west), or 8 (northwest). Tide stage was classed as flood, ebb or slack by observing the movement of the vessel while drifting with the gill net. Water depth was measured in fm using a Simrad echo sounder, and water clarity was measured in m using a 17.5 cm secchi disk.

Describing the Salmon Migration

Catchability, the fraction of the available population taken by a defined unit of fishing effort, was estimated as:

$$q_d = c_d/r_d, \quad (4)$$

where: q_d = estimated catchability on day d,

r_d = adjusted cumulative total return on day d, and
c_d = cumulative CPUE on day d.

Passage rate, the expansion factor used to convert CPUE into estimated numbers of salmon passing the test fishing transect, was calculated as:

$$PR = 1/q_d = \text{passage rate} \tag{5}$$

Since the test fishery did not encompass the entire sockeye salmon run, the total CPUE for the test fishery was estimated after the season using the following relationship:

$$CPUE_t = CPUE_f \times \frac{H_t}{H_{(f+2)}}, \tag{6}$$

where: $CPUE_t$ = total estimated CPUE for the season,
$CPUE_f$ = cumulative CPUE through final day, f, of test fishing,
H_t = total commercial harvest for the season
$H_{(f+2)}$ = total commercial catch through final day of test fishery (f+2), and
2 = number of days it took salmon to travel from test fishery to commercial harvest areas.

Estimates of $CPUE_t$ and $CPUE_d$ values were used to estimate daily and cumulative proportions of $CPUE_t$, based on a non-linear model:

$$y_d = 1/(1 + e^{-(a+bd)}) \tag{7}$$

where: y_d = cumulative proportion of CPUE or return on day d,
a and b = coefficients of model,
d = day of observation.

To calculate mean date of return, the following formula was used:

$$M = a/b \quad (8)$$

where: M = mean date of return.

RESULTS AND DISCUSSION

A total of 1,576 sockeye salmon, 556 pink salmon *O. gorbuscha*, 438 chum salmon *O. keta*, 547 coho salmon *O. kisutch*, and 3 chinook salmon *O. tshawytscha*, were captured during the 1998 test fishery (Table 1, Appendices A-D). Daily sockeye salmon catches ranged from 2 to 142 fish (Table 1).

Sockeye salmon daily CPUE values ranged from 1.7 on 26 July to 96.4 on 25 July. Cumulative total CPUE for the duration of the project was 1,158.4 (Table 1). Using post season commercial harvest figures, test fishing spanned approximately 86.2% of the total run. Therefore, total CPUE for the test fishery would have been 1,344 if test fishing had continued throughout the duration of the run.

Sockeye salmon catches along the transect were similar to the distribution of CPUE values (Tables 2 and 3).

Examination of daily and cumulative proportions (estimated post season) of the sockeye salmon run to UCI suggested that 7.7% of the run had passed the transect prior to the start of test fishing on 1 July and that the run was 85.6% completed at project termination (Appendix E; Figure 2). The mean date of the run was 18 July, which was three days late relative to the historic average (Table 4).

The total sockeye salmon run to UCI in 1998 was estimated to be 2.9 million fish of which 1.198 million were harvested in the commercial fishery (Table 5). Estimated passage rate for the season was 2,158 sockeye salmon per CPUE index point.

Water temperatures measured along the transect were relatively warm (9-10° C) early in July and then warmed to a high of 12.0°C toward to the end of July (Appendix F). Air temperatures fluctuated between 10°C and 19°C during the project (Appendix F). Wind velocities were generally low to moderate. However, winds of 20 knots or greater were recorded on six days (Appendix F). Wind direction was variable.

During the commercial salmon fishing season three estimates of the sockeye salmon total run were made. The first estimate was made on 13 July using a passage estimate based on the 10 July commercial fishery data. The passage rate estimate was 2553 sockeye salmon per index point. The total CPUE estimate was 1760 for a total return estimate of 4.49 million fish. In retrospect, this estimate was made at the 32% point of the return. The second estimate was made following the

commercial fishery of 17 July. Passage rate and total sockeye salmon CPUE was estimated at 2660 and 1637, respectively. On 17 July the run was approximately 47% into the district and the total return was estimated at 4.3 million sockeye salmon. At this point in the season other indicators of abundance suggested that the run was not as strong as the test fishery indicated. Therefore, the commercial salmon fishery was closed for two weeks. During this period no adjustments to the estimate of passage rate were made. On 25 July a total return estimate of 3.4 million fish was made using a total CPUE estimate of 1287 and the passage rate estimate from 17 July. At this point in the season (74% of the run into the inlet) salmon management decisions were being made on escapement rates into the Kenai and Susitna rivers and the test fish program was not a significant factor in these actions.

Reasons for the poor performance of the test fish in 1998 are unknown. Certainly, the commercial fishery closure made the program imprecise relative to passage rate estimates. However, the estimate on 17 July should have been better since it followed a major commercial fishery and was near the mid-point of the return.

LITERATURE CITED

Hilsinger, J.R. 1988. Run strength analysis of the 1987 sockeye salmon return to Upper Cook Inlet, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A88-19, Anchorage.

Hilsinger, J.R. and D. Waltemyer. 1987. Run strength analysis of the 1986 sockeye salmon return to Upper Cook Inlet, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Area Data Report 87-6, Soldotna.

Tarbox, K.E. 1990. An estimate of the migratory timing of sockeye salmon into Upper Cook, Alaska, in 1989 using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2S90-4, Anchorage.

Tarbox, K.E. 1992. An estimate of the migratory timing of sockeye salmon into Upper Cook Inlet, Alaska, in 1991 using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A92-07. Anchorage.

Tarbox, K.E. 1994. An estimate of the migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1993. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A94-13, Anchorage.

Tarbox, K.E. 1995. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1994. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A95-15, Anchorage.

Tarbox, K.E. 1996. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1995. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A96-07, Anchorage.

Tarbox, K.E. 1997. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A97-01, Anchorage.

Tarbox, K.E. 1998. An estimate of migratory timing and abundance of sockeye salmon into Upper Cook Inlet, Alaska, in 1997. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A98-22, Anchorage.

LITERATURE CITED, continued

Tarbox, K.E. and D. Waltemyer. 1989. An estimate of the 1988 total sockeye salmon return to Upper Cook Inlet, Alaska using a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2S89-4, Anchorage.

Waltemyer, D.L. 1983a. Migratory timing and abundance estimation of the 1982 sockeye salmon return to Upper Cook Inlet based on a test fishing program. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report 83-1, Soldotna.

_____ 1983b. Describing the migrations of salmon and estimating abundance of sockeye salmon returning in 1983 to Upper Cook Inlet based on a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report 84-1, Soldotna.

_____ 1986a. Use of a test fishery to describe and estimate the sockeye salmon total return to Upper Cook Inlet in 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report 86-1, Soldotna.

_____ 1986b. Run strength analysis of the 1985 sockeye salmon return to Upper Cook Inlet, Alaska based on a test fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report 86-5, Soldotna.

Table 1. Summary of sockeye salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1998.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE		Mean Length (mm)
			Daily	Cumul.	Daily	Cumul.	
01-Jul	6	227.0	27	27	21.0	21.0	530
02-Jul	6	221.0	26	53	21.1	42.1	533
03-Jul	6	228.5	87	140	62.3	104.4	538
04-Jul	6	221.5	18	158	14.5	118.9	534
05-Jul	6	238.0	114	272	81.7	200.6	531
06-Jul	6	220.5	14	286	11.0	211.6	540
07-Jul	6	229.0	46	332	35.0	246.5	534
08-Jul	6	220.0	10	342	8.1	254.6	530
09-Jul	0	60.0	33	375	33.0	287.6	
10-Jul	0	60.0	33	408	33.0	320.6	
11-Jul	6	225.0	44	452	33.5	354.2	533
12-Jul	6	229.5	73	525	54.4	408.6	541
13-Jul	6	215.5	102	627	91.9	500.5	541
14-Jul	6	196.0	17	644	13.2	513.7	539
15-Jul	6	228.0	35	679	23.7	537.4	542
16-Jul	6	220.5	68	747	49.3	586.7	550
17-Jul	6	242.0	71	818	47.7	634.4	542
18-Jul	6	216.0	63	881	43.0	677.4	548
19-Jul	6	229.0	46	927	33.2	710.6	545
20-Jul	6	230.5	65	992	49.6	760.2	540
21-Jul	3	292.5	74	1066	53.9	814.1	545
22-Jul	6	223.5	54	1120	39.1	853.2	550
23-Jul	6	237.0	77	1197	53.7	906.9	547
24-Jul	6	227.0	23	1220	17.7	924.6	540
25-Jul	6	249.5	142	1362	96.4	1021.0	542
26-Jul	6	216.5	2	1364	1.7	1022.7	510
27-Jul	6	216.5	33	1397	22.9	1045.6	543
28-Jul	6	230.0	35	1432	25.0	1070.6	525
29-Jul	6	267.0	134	1566	79.9	1150.5	545
30-Jul	6	220.5	10	1576	7.9	1158.4	531

Table 2. Estimated sockeye salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	3	16	6	1	1	0	27
02-Jul	2	4	4	7	6	3	26
03-Jul	1	10	15	1	0	60	87
04-Jul	3	7	3	5	0	0	18
05-Jul	2	6	3	30	48	25	114
06-Jul	0	4	1	7	1	1	14
07-Jul	0	7	1	10	25	3	46
08-Jul	6	0	0	2	1	1	10
09-Jul	33						33
10-Jul	33						33
11-Jul	5	23	12	4	0	0	44
12-Jul	3	0	25	11	34	0	73
13-Jul	0	0	52	48	2	0	102
14-Jul	0	0	0	3	11	3	17
15-Jul	3	30	0	1	1	0	35
16-Jul	0	2	36	26	4	0	68
17-Jul	4	21	42	3	0	1	71
18-Jul	0	56	4	0	3	0	63
19-Jul	0	1	33	11	0	1	46
20-Jul	15	9	18	19	4	0	65
21-Jul	2	26	37	7	2	0	74
22-Jul	0	45	8	0	1	0	54
23-Jul	0	0	17	34	25	1	77
24-Jul	1	2	7	0	10	3	23
25-Jul	3	51	49	2	28	9	142
26-Jul	2	0	0	0	0	0	2
27-Jul	0	0	32	1	0	0	33
28-Jul	0	1	1	5	2	26	35
29-Jul	0	4	50	35	41	4	134
30-Jul	0	0	5	0	5	0	10
Total	121	325	461	273	255	141	1576
%	7.7	20.6	29.3	17.3	16.2	8.9	100.0

Table 3. Estimated sockeye salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	2.4	12.5	4.5	0.8	0.8	0.0	21.0
02-Jul	1.6	3.2	3.2	5.5	4.9	2.5	21.1
03-Jul	0.8	8.0	12.7	0.8	0.0	40.0	62.3
04-Jul	2.5	5.7	2.4	3.9	0.0	0.0	14.5
05-Jul	1.6	4.8	2.3	22.5	32.4	18.1	81.7
06-Jul	0.0	3.3	0.8	5.3	0.8	0.8	11.0
07-Jul	0.0	5.5	0.8	8.1	18.3	2.2	35.0
08-Jul	4.8	0.0	0.0	1.6	0.8	0.9	8.1
09-Jul	33.0						33.0
10-Jul	33.0						33.0
11-Jul	4.1	17.2	9.0	3.2	0.0	0.0	33.5
12-Jul	2.4	0.0	18.9	8.8	24.3	0.0	54.4
13-Jul	0.0	0.0	55.7	34.7	1.5	0.0	91.9
14-Jul	0.0	0.0	0.0	2.3	8.6	2.3	13.2
15-Jul	2.3	19.8	0.0	0.8	0.8	0.0	23.7
16-Jul	0.0	1.6	25.7	18.8	3.2	0.0	49.3
17-Jul	3.1	14.8	26.8	2.2	0.0	0.8	47.7
18-Jul	0.0	37.4	3.2	0.0	2.4	0.0	43.0
19-Jul	0.0	0.8	23.3	8.3	0.0	0.8	33.2
20-Jul	11.5	7.0	13.7	14.1	3.3	0.0	49.6
21-Jul	3.8	18.4	22.6	7.0	2.0	0.0	53.9
22-Jul	0.0	32.1	6.2	0.0	0.8	0.0	39.1
23-Jul	0.0	0.0	13.1	22.4	17.4	0.8	53.7
24-Jul	0.8	1.6	5.1	0.0	7.8	2.4	17.7
25-Jul	2.5	35.2	31.0	1.5	19.5	6.7	96.4
26-Jul	1.7	0.0	0.0	0.0	0.0	0.0	1.7
27-Jul	0.0	0.0	22.1	0.8	0.0	0.0	22.9
28-Jul	0.0	0.8	0.8	3.7	1.6	18.1	25.0
29-Jul	0.0	3.1	28.3	21.2	24.1	3.2	79.9
30-Jul	0.0	0.0	3.9	0.0	4.0	0.0	7.9
Total	111.9	232.8	336.1	198.4	179.4	99.7	1158.4
%	9.7	20.1	29.0	17.1	15.5	8.6	100.0

Table 4. Mean date of the sockeye salmon run across Anchor Point transect, Upper Cook Inlet offshore test fish project, 1979-1998.

Year	Mean Date[a] Coded	Calendar
1979	18.4	July 11
1980	22.7	July 15
1981	13.2	July 06
1982	24.2	July 17
1983	22.6	July 15
1984	18.4	July 11
1985	22.7	July 15
1986	23.0	July 16
1987	25.7	July 18
1988	20.6	July 13
1989	21.6	July 14
1990	25.6	July 18
1991	24.3	July 17
1992	24.3	July 17
1993	21.4	July 14
1994	26.2	July 19
1995	22.1	July 15
1996	20.4	July 13
1997	23.6	July 16
1998	24.9	July 18
1979-1997	22.0	July 15

[a] Day (1) = June 24. File: otf98t4.doc

Table 5. The 1998 Upper Cook Inlet commercial sockeye salmon harvest.

Day	Harvest	Culumative Harvest	Culumative Percent
1-Jun	713	713	0.06
3-Jun	750	1,463	0.12
5-Jun	358	1,821	0.15
8-Jun	195	2,016	0.17
10-Jun	110	2,126	0.18
12-Jun	105	2,231	0.19
15-Jun	189	2,420	0.20
17-Jun	162	2,582	0.22
19-Jun	150	2,732	0.23
22-Jun	210	2,942	0.25
26-Jun	9,205	12,147	1.01
29-Jun	39,823	51,970	4.34
3-Jul	66,280	118,250	9.87
6-Jul	88,851	207,101	17.29
10-Jul	175,031	382,132	31.91
11-Jul	9,105	391,237	32.67
13-Jul	28,202	419,439	35.02
15-Jul	152,437	571,876	47.75
17-Jul	360,989	932,865	77.89
19-Jul	2,567	935,432	78.10
20-Jul	17,855	953,287	79.59
24-Jul	24,383	977,670	81.63
27-Jul	5,934	983,604	82.12
31-Jul	7,200	990,804	82.72
1-Aug	41,910	1,032,714	86.22
2-Aug	41,369	1,074,083	89.68
3-Aug	71,050	1,145,133	95.61
5-Aug	21,037	1,166,170	97.37
7-Aug	17,420	1,183,590	98.82
10-Aug	11,098	1,194,688	99.75
14-Aug	1,283	1,195,971	99.85
17-Aug	851	1,196,822	99.93
21-Aug	518	1,197,340	99.97
24-Aug	191	1,197,531	99.99
28-Aug	179	1,197,710	100.00

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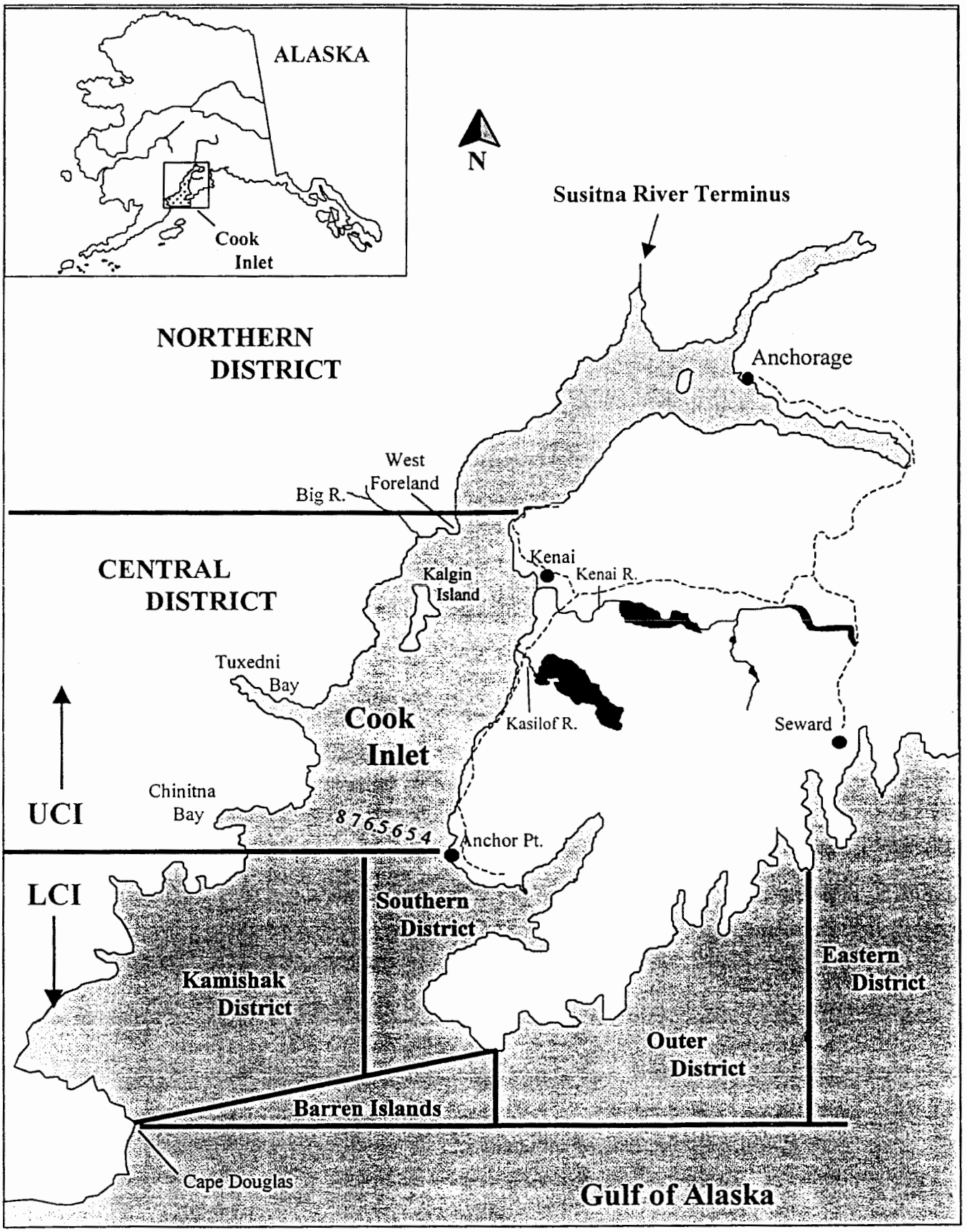

Figure 1. Location of fishing districts and offshore test fish transect in Cook Inlet, Alaska, 1998..

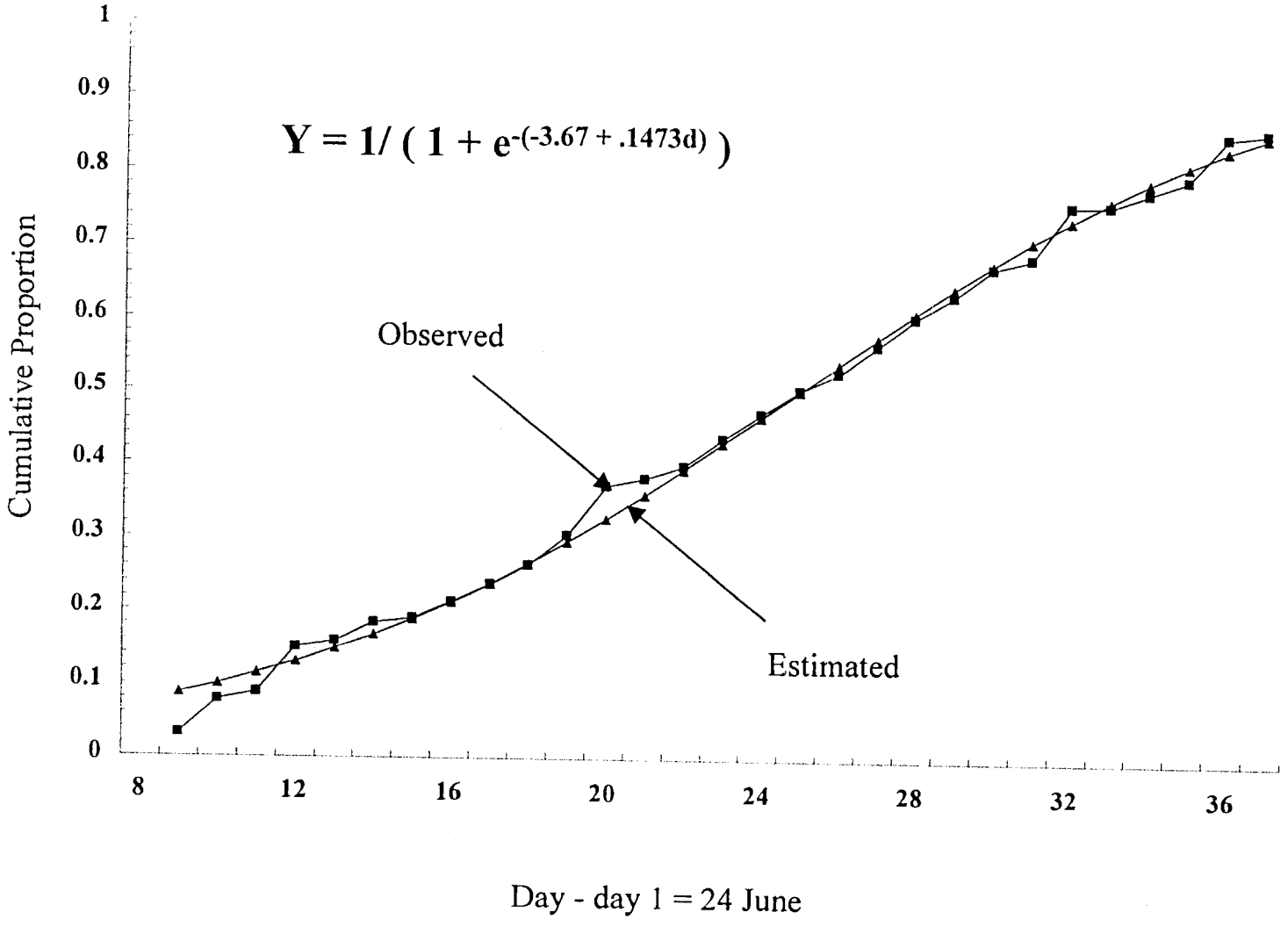

Figure 2. Cumulative proportions estimated for the sockeye salmon return to Upper Cook Inlet, Alaska 1998.

Appendix A1. Summary of pink salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1998.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumul.	Daily	Cumul.
01-Jul	6	227.0	0	0	0.0	0.0
02-Jul	6	221.0	0	0	0.0	0.0
03-Jul	6	228.5	1	1	0.6	0.6
04-Jul	6	221.5	0	1	0.0	0.6
05-Jul	6	238.0	4	5	2.9	3.5
06-Jul	6	220.5	0	5	0.0	3.5
07-Jul	6	229.0	3	8	2.2	5.7
08-Jul	6	220.0	1	9	0.8	6.5
09-Jul	0	60.0	3	12	3.0	9.5
10-Jul	0	60.0	3	15	3.0	12.5
11-Jul	6	225.0	4	19	3.1	15.6
12-Jul	6	229.5	8	27	6.3	22.0
13-Jul	6	215.5	40	67	33.7	55.7
14-Jul	6	196.0	7	74	5.4	61.1
15-Jul	6	228.0	14	88	9.4	70.5
16-Jul	6	220.5	9	97	6.6	77.1
17-Jul	6	242.0	34	131	23.7	100.8
18-Jul	6	216.0	26	157	19.1	119.9
19-Jul	6	229.0	39	196	29.2	149.1
20-Jul	6	230.5	48	244	37.1	186.2
21-Jul	3	292.5	32	276	21.9	208.1
22-Jul	6	223.5	2	278	1.4	209.5
23-Jul	6	237.0	76	354	52.3	261.8
24-Jul	6	227.0	35	389	25.9	287.7
25-Jul	6	249.5	70	459	48.1	335.8
26-Jul	6	216.5	15	474	12.3	348.1
27-Jul	6	216.5	11	485	7.8	355.9
28-Jul	6	230.0	23	508	17.3	373.2
29-Jul	6	267.0	36	544	23.2	396.4
30-Jul	6	220.5	12	556	9.8	406.2

Appendix A2. Estimated pink salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0	0	0	0	0	0	0
02-Jul	0	0	0	0	0	0	0
03-Jul	0	0	0	0	0	1	1
04-Jul	0	0	0	0	0	0	0
05-Jul	0	1	1	0	1	1	4
06-Jul	0	0	0	0	0	0	0
07-Jul	0	0	0	0	2	1	3
08-Jul	0	0	0	1	0	0	1
09-Jul	3						3
10-Jul	3						3
11-Jul	0	0	3	1	0	0	4
12-Jul	3	4	1	0	0	0	8
13-Jul	0	0	13	21	6	0	40
14-Jul	0	0	0	1	6	0	7
15-Jul	1	12	1	0	0	0	14
16-Jul	0	0	6	1	1	1	9
17-Jul	4	5	15	9	0	1	34
18-Jul	0	12	10	0	3	1	26
19-Jul	0	5	11	23	0	0	39
20-Jul	11	8	10	11	8	0	48
21-Jul	0	9	20	0	3	0	32
22-Jul	0	2	0	0	0	0	2
23-Jul	4	0	1	33	38	0	76
24-Jul	0	0	29	1	5	0	35
25-Jul	0	14	25	8	15	8	70
26-Jul	0	0	9	2	4	0	15
27-Jul	0	0	9	1	0	1	11
28-Jul	1	3	0	4	6	9	23
29-Jul	3	5	18	2	4	4	36
30-Jul	0	3	3	1	2	3	12
Total	33	83	185	120	104	31	556
%	5.9	14.9	33.3	21.6	18.7	5.6	100.0

Appendix A3. Estimated pink salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03-Jul	0.0	0.0	0.0	0.0	0.0	0.6	0.6
04-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05-Jul	0.0	0.8	0.8	0.0	0.6	0.7	2.9
06-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
07-Jul	0.0	0.0	0.0	0.0	1.5	0.7	2.2
08-Jul	0.0	0.0	0.0	0.8	0.0	0.0	0.8
09-Jul	3.0						3.0
10-Jul	3.0						3.0
11-Jul	0.0	0.0	2.3	0.8	0.0	0.0	3.1
12-Jul	2.4	3.2	0.7	0.0	0.0	0.0	6.3
13-Jul	0.0	0.0	13.9	15.2	4.6	0.0	33.7
14-Jul	0.0	0.0	0.0	0.7	4.7	0.0	5.4
15-Jul	0.7	7.9	0.8	0.0	0.0	0.0	9.4
16-Jul	0.0	0.0	4.3	0.7	0.8	0.8	6.6
17-Jul	3.1	3.5	9.6	6.7	0.0	0.8	23.7
18-Jul	0.0	8.0	7.9	0.0	2.4	0.8	19.1
19-Jul	0.0	4.1	7.8	17.3	0.0	0.0	29.2
20-Jul	8.5	6.2	7.6	8.2	6.6	0.0	37.1
21-Jul	0.0	6.4	12.2	0.0	3.3	0.0	21.9
22-Jul	0.0	1.4	0.0	0.0	0.0	0.0	1.4
23-Jul	3.3	0.0	0.8	21.7	26.5	0.0	52.3
24-Jul	0.0	0.0	21.2	0.8	3.9	0.0	25.9
25-Jul	0.0	9.7	15.8	6.2	10.5	5.9	48.1
26-Jul	0.0	0.0	7.4	1.6	3.3	0.0	12.3
27-Jul	0.0	0.0	6.2	0.8	0.0	0.8	7.8
28-Jul	0.8	2.4	0.0	2.9	4.9	6.3	17.3
29-Jul	2.4	3.8	10.2	1.2	2.4	3.2	23.2
30-Jul	0.0	2.5	2.4	0.8	1.6	2.5	9.8
Total	27.2	59.9	131.9	86.4	77.6	23.1	406.2
%	6.7	14.7	32.5	21.3	19.1	5.7	100.0

Appendix B1. Summary of chum salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1998.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumul.	Daily	Cumul.
01-Jul	6	227.0	1	1	0.8	0.8
02-Jul	6	221.0	1	2	0.8	1.6
03-Jul	6	228.5	8	10	6.0	7.6
04-Jul	6	221.5	8	18	6.3	13.9
05-Jul	6	238.0	17	35	11.7	25.6
06-Jul	6	220.5	11	46	8.7	34.3
07-Jul	6	229.0	16	62	12.3	46.5
08-Jul	6	220.0	12	74	9.7	56.2
09-Jul	0	60.0	9	83	9.0	65.2
10-Jul	0	60.0	10	93	10.0	75.2
11-Jul	6	225.0	15	108	11.4	86.7
12-Jul	6	229.5	6	114	4.5	91.2
13-Jul	6	215.5	22	136	18.3	109.5
14-Jul	6	196.0	1	137	0.8	110.3
15-Jul	6	228.0	5	142	3.3	113.6
16-Jul	6	220.5	7	149	5.1	118.7
17-Jul	6	242.0	45	194	29.4	148.1
18-Jul	6	216.0	10	204	6.9	155.0
19-Jul	6	229.0	5	209	3.5	158.5
20-Jul	6	230.5	13	222	9.7	168.2
21-Jul	3	292.5	12	234	8.4	176.6
22-Jul	6	223.5	4	238	2.9	179.5
23-Jul	6	237.0	26	264	17.6	197.1
24-Jul	6	227.0	5	269	3.8	200.9
25-Jul	6	249.5	35	304	24.5	225.4
26-Jul	6	216.5	0	304	0.0	225.4
27-Jul	6	216.5	25	329	18.3	243.7
28-Jul	6	230.0	14	343	10.5	254.2
29-Jul	6	267.0	90	433	53.7	307.9
30-Jul	6	220.5	5	438	4.0	311.9

Appendix B2. Estimated chum salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0	0	1	0	0	0	1
02-Jul	0	0	1	0	0	0	1
03-Jul	0	0	1	4	0	3	8
04-Jul	1	1	1	2	3	0	8
05-Jul	0	0	0	0	11	6	17
06-Jul	0	0	7	4	0	0	11
07-Jul	1	2	1	1	2	9	16
08-Jul	0	5	3	4	0	0	12
09-Jul	9						9
10-Jul	10						10
11-Jul	1	5	7	2	0	0	15
12-Jul	0	1	2	1	2	0	6
13-Jul	0	0	7	14	1	0	22
14-Jul	0	0	0	0	1	0	1
15-Jul	0	5	0	0	0	0	5
16-Jul	0	0	5	1	0	1	7
17-Jul	0	6	36	3	0	0	45
18-Jul	0	8	1	0	1	0	10
19-Jul	0	0	5	0	0	0	5
20-Jul	2	1	2	8	0	0	13
21-Jul	0	0	9	3	0	0	12
22-Jul	0	4	0	0	0	0	4
23-Jul	0	1	2	20	3	0	26
24-Jul	0	1	3	1	0	0	5
25-Jul	0	11	4	0	11	9	35
26-Jul	0	0	0	0	0	0	0
27-Jul	0	0	17	8	0	0	25
28-Jul	0	1	1	11	1	0	14
29-Jul	0	6	43	10	29	2	90
30-Jul	0	1	2	0	2	0	5
Total	24	59	161	97	67	30	438
%	5.5	13.5	36.8	22.1	15.3	6.8	100.0

Appendix B3. Estimated chum salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0.0	0.0	0.8	0.0	0.0	0.0	0.8
02-Jul	0.0	0.0	0.8	0.0	0.0	0.0	0.8
03-Jul	0.0	0.0	0.8	3.2	0.0	2.0	6.0
04-Jul	0.8	0.8	0.8	1.5	2.4	0.0	6.3
05-Jul	0.0	0.0	0.0	0.0	7.4	4.3	11.7
06-Jul	0.0	0.0	5.7	3.0	0.0	0.0	8.7
07-Jul	0.8	1.6	0.8	0.8	1.5	6.7	12.3
08-Jul	0.0	3.9	2.6	3.2	0.0	0.0	9.7
09-Jul	9.0						9.0
10-Jul	10.0						10.0
11-Jul	0.8	3.7	5.3	1.6	0.0	0.0	11.4
12-Jul	0.0	0.8	1.5	0.8	1.4	0.0	4.5
13-Jul	0.0	0.0	7.5	10.1	0.7	0.0	18.3
14-Jul	0.0	0.0	0.0	0.0	0.8	0.0	0.8
15-Jul	0.0	3.3	0.0	0.0	0.0	0.0	3.3
16-Jul	0.0	0.0	3.6	0.7	0.0	0.8	5.1
17-Jul	0.0	4.2	23.0	2.2	0.0	0.0	29.4
18-Jul	0.0	5.3	0.8	0.0	0.8	0.0	6.9
19-Jul	0.0	0.0	3.5	0.0	0.0	0.0	3.5
20-Jul	1.5	0.8	1.5	5.9	0.0	0.0	9.7
21-Jul	0.0	0.0	5.5	2.9	0.0	0.0	8.4
22-Jul	0.0	2.9	0.0	0.0	0.0	0.0	2.9
23-Jul	0.0	0.8	1.5	13.2	2.1	0.0	17.6
24-Jul	0.0	0.8	2.2	0.8	0.0	0.0	3.8
25-Jul	0.0	7.6	2.5	0.0	7.7	6.7	24.5
26-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Jul	0.0	0.0	11.7	6.6	0.0	0.0	18.3
28-Jul	0.0	0.8	0.8	8.1	0.8	0.0	10.5
29-Jul	0.0	4.6	24.3	6.1	17.1	1.6	53.7
30-Jul	0.0	0.8	1.6	0.0	1.6	0.0	4.0
Total	22.9	42.7	109.1	70.8	44.3	22.1	311.9
%	7.3	13.7	35.0	22.7	14.2	7.1	100.0

Appendix C1. Summary of coho salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1998.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumul.	Daily	Cumul.
01-Jul	6	227.0	3	3	2.3	2.3
02-Jul	6	221.0	3	6	1.0	3.3
03-Jul	6	228.5	3	9	2.2	5.5
04-Jul	6	221.5	2	11	1.6	7.1
05-Jul	6	238.0	9	20	6.3	13.4
06-Jul	6	220.5	8	28	6.1	19.5
07-Jul	6	229.0	12	40	9.2	28.7
08-Jul	6	220.0	2	42	1.6	30.3
09-Jul	0	60.0	9	51	9.0	39.3
10-Jul	0	60.0	9	60	9.0	48.3
11-Jul	6	225.0	4	64	3.0	51.3
12-Jul	6	229.5	28	92	21.9	73.2
13-Jul	6	215.5	22	114	20.5	93.7
14-Jul	6	196.0	4	118	4.7	98.4
15-Jul	6	228.0	34	152	23.3	121.7
16-Jul	6	220.5	18	170	13.9	135.6
17-Jul	6	242.0	78	248	52.9	188.5
18-Jul	6	216.0	9	257	6.6	195.1
19-Jul	6	229.0	47	304	33.9	229.0
20-Jul	6	230.5	7	311	5.2	234.2
21-Jul	3	292.5	6	317	4.7	239.0
22-Jul	6	223.5	18	335	17.7	256.7
23-Jul	6	237.0	27	362	18.6	275.3
24-Jul	6	227.0	12	374	9.1	284.4
25-Jul	6	249.5	44	418	31.2	315.6
26-Jul	6	216.5	8	426	6.5	322.1
27-Jul	6	216.5	23	449	17.8	339.9
28-Jul	6	230.0	22	471	16.4	356.3
29-Jul	6	267.0	70	541	42.3	398.6
30-Jul	6	220.5	6	547	4.8	403.4

Appendix C2. Estimated coho salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0	1	1	1	0	0	3
02-Jul	2	0	0	1	0	0	3
03-Jul	0	0	1	1	0	1	3
04-Jul	1	0	0	0	1	0	2
05-Jul	0	0	0	1	5	3	9
06-Jul	0	0	0	8	0	0	8
07-Jul	0	2	0	3	1	6	12
08-Jul	0	1	0	1	0	0	2
09-Jul	9						9
10-Jul	9						9
11-Jul	0	1	2	1	0	0	4
12-Jul	0	0	4	11	6	7	28
13-Jul	0	0	13	7	2	0	22
14-Jul	0	1	0	0	3	0	4
15-Jul	0	29	1	2	2	0	34
16-Jul	0	11	3	3	0	1	18
17-Jul	0	24	39	15	0	0	78
18-Jul	0	5	0	3	1	0	9
19-Jul	0	1	35	8	0	3	47
20-Jul	1	0	1	5	0	0	7
21-Jul	0	1	3	2	0	0	6
22-Jul	0	4	12	1	0	1	18
23-Jul	0	0	2	13	11	1	27
24-Jul	0	0	4	0	8	0	12
25-Jul	0	10	7	1	4	22	44
26-Jul	0	0	5	1	1	1	8
27-Jul	0	0	8	14	0	1	23
28-Jul	0	2	0	8	4	8	22
29-Jul	0	5	22	18	23	2	70
30-Jul	0	1	1	0	3	1	6
Total	22	99	164	129	75	58	547
%	4.0	18.1	30.0	23.6	13.7	10.6	100.0

Appendix C3. Estimated coho salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0.0	0.8	0.8	0.8	0.0	0.0	2.3
02-Jul	0.2	0.0	0.0	0.8	0.0	0.0	1.0
03-Jul	0.0	0.0	0.8	0.8	0.0	0.6	2.2
04-Jul	0.8	0.0	0.0	0.0	0.8	0.0	1.6
05-Jul	0.0	0.0	0.0	0.7	3.4	2.2	6.3
06-Jul	0.0	0.0	0.0	6.1	0.0	0.0	6.1
07-Jul	0.0	1.6	0.0	2.4	0.7	4.5	9.2
08-Jul	0.0	0.8	0.0	0.8	0.0	0.0	1.6
09-Jul	9.0						9.0
10-Jul	9.0						9.0
11-Jul	0.0	0.7	1.5	0.8	0.0	0.0	3.0
12-Jul	0.0	0.0	3.0	8.8	4.3	5.8	21.9
13-Jul	0.0	0.0	13.9	5.1	1.5	0.0	20.5
14-Jul	0.0	2.4	0.0	0.0	2.3	0.0	4.7
15-Jul	0.0	19.1	0.8	1.7	1.7	0.0	23.3
16-Jul	0.0	8.8	2.1	2.2	0.0	0.8	13.9
17-Jul	0.0	16.9	24.9	11.1	0.0	0.0	52.9
18-Jul	0.0	3.3	0.0	2.5	0.8	0.0	6.6
19-Jul	0.0	0.8	24.7	6.0	0.0	2.4	33.9
20-Jul	0.8	0.0	0.7	3.7	0.0	0.0	5.2
21-Jul	0.0	0.7	1.8	2.2	0.0	0.0	4.7
22-Jul	0.0	2.9	13.2	0.8	0.0	0.8	17.7
23-Jul	0.0	0.0	1.5	8.6	7.7	0.8	18.6
24-Jul	0.0	0.0	2.9	0.0	6.2	0.0	9.1
25-Jul	0.0	6.9	4.4	0.8	2.8	16.3	31.2
26-Jul	0.0	0.0	4.1	0.8	0.8	0.8	6.5
27-Jul	0.0	0.0	5.5	11.5	0.0	0.8	17.8
28-Jul	0.0	1.6	0.0	5.9	3.3	5.6	16.4
29-Jul	0.0	3.8	12.5	10.9	13.5	1.6	42.3
30-Jul	0.0	0.8	0.8	0.0	2.4	0.8	4.8
Total	19.8	71.9	119.9	95.9	52.2	43.8	403.4
%	4.9	17.8	29.7	23.8	12.9	10.9	100.0

Appendix D1. Summary of chinook salmon fishing effort, daily and cumulative catch, and daily and cumulative CPUE, Upper Cook Inlet offshore test fish project, 1998.

Date	Number of Stations	Mean Fishing Time (min)	Catch		CPUE	
			Daily	Cumul.	Daily	Cumul.
01-Jul	6	227.0	0	0	0.0	0.0
02-Jul	6	221.0	1	1	0.8	0.8
03-Jul	6	228.5	0	1	0.0	0.8
04-Jul	6	221.5	0	1	0.0	0.8
05-Jul	6	238.0	0	1	0.0	0.8
06-Jul	6	220.5	0	1	0.0	0.8
07-Jul	6	229.0	2	3	1.6	2.4
08-Jul	6	220.0	0	3	0.0	2.4
09-Jul	0	60.0	0	3	0.0	2.4
10-Jul	0	60.0	0	3	0.0	2.4
11-Jul	6	225.0	0	3	0.0	2.4
12-Jul	6	229.5	0	3	0.0	2.4
13-Jul	6	215.5	0	3	0.0	2.4
14-Jul	6	196.0	0	3	0.0	2.4
15-Jul	6	228.0	0	3	0.0	2.4
16-Jul	6	220.5	0	3	0.0	2.4
17-Jul	6	242.0	0	3	0.0	2.4
18-Jul	6	216.0	0	3	0.0	2.4
19-Jul	6	229.0	0	3	0.0	2.4
20-Jul	6	230.5	0	3	0.0	2.4
21-Jul	3	292.5	0	3	0.0	2.4
22-Jul	6	223.5	0	3	0.0	2.4
23-Jul	6	237.0	0	3	0.0	2.4
24-Jul	6	227.0	0	3	0.0	2.4
25-Jul	6	249.5	0	3	0.0	2.4
26-Jul	6	216.5	0	3	0.0	2.4
27-Jul	6	216.5	0	3	0.0	2.4
28-Jul	6	230.0	0	3	0.0	2.4
29-Jul	6	267.0	0	3	0.0	2.4
30-Jul	6	220.5	0	3	0.0	2.4

Appendix D2. Estimated chinook salmon catch by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0	0	0	0	0	0	0
02-Jul	0	0	1	0	0	0	1
03-Jul	0	0	0	0	0	0	0
04-Jul	0	0	0	0	0	0	0
05-Jul	0	0	0	0	0	0	0
06-Jul	0	0	0	0	0	0	0
07-Jul	0	2	0	0	0	0	2
08-Jul	0	0	0	0	0	0	0
09-Jul	0						0
10-Jul	0						0
11-Jul	0	0	0	0	0	0	0
12-Jul	0	0	0	0	0	0	0
13-Jul	0	0	0	0	0	0	0
14-Jul	0	0	0	0	0	0	0
15-Jul	0	0	0	0	0	0	0
16-Jul	0	0	0	0	0	0	0
17-Jul	0	0	0	0	0	0	0
18-Jul	0	0	0	0	0	0	0
19-Jul	0	0	0	0	0	0	0
20-Jul	0	0	0	0	0	0	0
21-Jul	0	0	0	0	0	0	0
22-Jul	0	0	0	0	0	0	0
23-Jul	0	0	0	0	0	0	0
24-Jul	0	0	0	0	0	0	0
25-Jul	0	0	0	0	0	0	0
26-Jul	0	0	0	0	0	0	0
27-Jul	0	0	0	0	0	0	0
28-Jul	0	0	0	0	0	0	0
29-Jul	0	0	0	0	0	0	0
30-Jul	0	0	0	0	0	0	0
Total	0	2	1	0	0	0	3
%	0.0	66.7	33.3	0.0	0.0	0.0	100.0

Appendix D3. Estimated chinook salmon CPUE by date and station, Upper Cook Inlet offshore test fish project, 1998.

	Station Number						
Date	4	5	6	6.5	7	8	Total
01-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02-Jul	0.0	0.0	0.8	0.0	0.0	0.0	0.8
03-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
04-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
06-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
07-Jul	0.0	1.6	0.0	0.0	0.0	0.0	1.6
08-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
09-Jul	0.0						0.0
10-Jul	0.0						0.0
11-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	0.0	1.6	0.8	0.0	0.0	0.0	2.4
%	0.0	66.7	33.3	0.0	0.0	0.0	100.0

Appendix E1. Entry pattern of sockeye salmon into Upper Cook Inlet, Alaska, 1998, estimated from daily CPUE measured at the latitude of Anchor Point

Day	Date	Input Y	Estimated Y	Residual	Change in input Y	Change in estimated Y
8	701					
9	702	0.0313	0.0875	-0.0562	0.0157	0.0111
10	703	0.0777	0.1	-0.0224	0.0464	0.0125
11	704	0.0885	0.1141	-0.0257	0.0108	0.0141
12	705	0.1492	0.1299	0.0194	0.0608	0.0158
13	706	0.1574	0.1474	0.01	0.0082	0.0176
14	707	0.1834	0.1669	0.0165	0.026	0.0195
15	708	0.1894	0.1884	0.001	0.006	0.0215
16	709	0.214	0.212	0.002	0.0246	0.0236
17	710	0.2386	0.2377	0.0009	0.0246	0.0257
18	711	0.2635	0.2654	-0.0019	0.025	0.0277
19	712	0.304	0.2951	0.0089	0.0405	0.0297
20	713	0.3724	0.3266	0.0458	0.0684	0.0315
21	714	0.3822	0.3598	0.0224	0.0098	0.0332
22	715	0.3998	0.3944	0.0054	0.0176	0.0346
23	716	0.4365	0.4301	0.0064	0.0367	0.0357
24	717	0.472	0.4665	0.0055	0.0355	0.0364
25	718	0.504	0.5033	0.0007	0.032	0.0368
26	719	0.5287	0.54	-0.0113	0.0247	0.0367
27	720	0.5656	0.5763	-0.0107	0.0369	0.0363
28	721	0.6057	0.6118	-0.0061	0.0401	0.0355
29	722	0.6348	0.6462	-0.0114	0.0291	0.0344
30	723	0.6748	0.6791	-0.0044	0.04	0.0329
31	724	0.6879	0.7103	-0.0224	0.0132	0.0312
32	725	0.7597	0.7397	0.02	0.0717	0.0294
33	726	0.7609	0.767	-0.0061	0.0013	0.0274
34	727	0.778	0.7923	-0.0144	0.017	0.0253
35	728	0.7966	0.8155	-0.019	0.0186	0.0232
36	729	0.856	0.8367	0.0193	0.0594	0.0211
37	730	0.8619	0.8558	0.0061	0.0059	0.0191

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Appendix F. Chemical and physical observations made in Upper Cook Inlet, Alaska during the conduct of the 1998 offshore test fish project.

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
01-Jul	4	10	9.2	10	6	4	31.1	25.6	7
	5	10	9.6	12	6	3	30.8	35	5
	6	10	10	15	6	3	29.5	48	3
	6.5	11	10	12	6	3	29.6	44	2
	7	12	10.1	11	6	3	29.4	44	2
	8	13	10	8	6	2	29.7	26	2
02-Jul	8	12	9.8	7	5	4	29.6	28	2
	7	12	10.2	5	6	4	28.3	45	2
	6.5	11	10.2	5	6	4	28.6	44	2
	6	12	10.2	8	8	4	28.8	46	3
	5	12	9.5	10	8	1	30.2	37	3
	4	11	9.3	10	1	3	31.1	26	4
03-Jul	4	12	9.2	20	8	4	30.7	25	5
	5	11	9.2	20	8	4	30.8	36	5
	6	11	9.3	22	1	1	30.9	47	3
	6.5	11	10	18	8	3	29.6	44	3
	7	11	10.1	20	8	3	29.4	45	2.5
	8	12	10	15	8	3	29.3	29	2.5
04-Jul	8	11	10	10	5	3	29	30	3
	7	10	9.8	15	5	3	29.9	44	3
	6.5	10	9.7	15	5	3	30.2	43	3
	6	11	9.5	13	5	4	30.6	46	4
	5	11	9.5	12	5	4	31	36	7
	4	11	9.5	15	6	4	31	25	7
05-Jul	4	13	9.4	22	8	4	31	25	3
	5	13	9.4	18	1	4	31.1	37	4
	6	12	9.5	19	1	4	31.1	48	6
	6.5	12	10	13	2	4	30.4	43	3.5
	7	13	10.4	20	4	1	29.1	45	2.5
	8	12	10.7	21	5	3	28.3	29	2.5
06-Jul	8	11	10.1	15	6	3	28.7	29	2.5
	7	12	10.4	14	6	3	28	43	2
	6.5	12	10.6	13	6	3	27.1	43	2
	6	12	10.7	13	5	2	26.8	47.8	3
	5	15	9.8	5	6	4	30.3	36	7
	4	15	9.5	0	0	4	31.2	24	10
07-Jul	4	12	9.9	5	5	4	30.4	25	8
	5	13	10	8	6	4	30.2	36	6
	6	13	10.6	8	6	4	28.7	39	6

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Appendix F. (p 2 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
07-Jul	6.5	14	11.7	10	4	4	26.4	43	2.5
	7	12	11.5	20	6	4	26.4	46	3
	8	14	11.9	18	6	4	26.3	27	2
08-Jul	8	11	10.3	13	6	3	28.6	30	3
	7	10	10.2	12	6	3	28.3	41	2
	6.5	12	10.3	10	5	3	28.7	44	3
	6	11	10.8	15	4	3	27.8	46	3.5
	5	12	9.8	10	5	3	30.8	33	7
	4	12	9.8	9	4	3	30.9	24	8
09-Jul	4	-1	-1	-1	-1	-1	-1	-1	-1
10-Jul	4	-1	-1	-1	-1	-1	-1	-1	-1
11-Jul	4	11	9.7	8	8	3	31.3	22	10
	5	15	9.5	10	8	3	31.2	31	7
	6	11	9.8	10	8	2	30.6	47	4
	6.5	11	9.9	11	8	4	30.5	43	3.5
	7	11	10	0	0	4	30	45	3.5
	8	11	10.3	8	8	4	29.4	32	2
12-Jul	8	11	10	20	6	4	29.4	32	2
	7	10	9.9	20	6	1	30.8	44	4
	6.5	10	9.8	18	4	3	30.3	47	4
	6	11	9.9	18	4	3	30.1	48	3
	5	11	9.6	12	4	3	30.9	31	5
	4	10	9.3	10	4	3	31.6	23	9
13-Jul	4	14	9.4	0	0	3	31.7	25	14.5
	5	10	9.5	0	0	3	31.4	33	9
	6	11	11	0	0	3	30.8	47	4
	6.5	16	10.8	5	8	3	30.2	44	3
	7	14	10.2	5	8	3	29.9	42	2
	8	16	11	5	8	4	29.4	31	2
14-Jul	8	12	10.4	8	4	4	29.3	31	3
	7	11	10	10	4	4	30.5	44	4
	6.5	12	9.8	5	4	1	30.9	47	6
	6	14	9.4	2	4	3	31.2	49	10
	5	14	9.4	0	0	3	31.4	34	12
	4	14	9.5	0	0	3	31.6	23	15
15-Jul	4	10	9.5	12	6	1	21.7	24	11
	5	10	10.2	12	6	3	30.1	34	6
	6	12	10.6	10	6	3	29.5	45	2.5
	6.5	12	10.5	8	6	3	29.7	41	2.5
	7	12	10.7	5	6	3	29.2	45	3
	8	11	10.5	5	4	4	29.7	27	2

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Appendix F. (p 3 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
16-Jul	8	11	10.8	5	8	4	28.8	31	3
	7	11	10.6	2	1	4	29.5	45	2
	6.5	11	10.7	5	8	4	29.3	44	3
	6	11	10.6	10	8	4	29.3	47	3
	5	12	9.5	10	8	1	31.4	37	8
	4	12	9.5	0	0	23	31.5	24	12
17-Jul	4	10	9.7	12	5	4	31.6	24	10
	5	10	9.6	15	5	1	31.4	37	7
	6	12	10.8	10	4	3	29.4	48	4
	6.5	13	11	12	6	3	29.3	43	3
	7	13	11.1	10	6	3	29.2	44	3.5
	8	13	11.1	16	4	3	29.3	29	2.5
18-Jul	8	10	10.6	5	6	3	29.5	29	3
	7	11	11.3	2	8	3	27.4	44	3
	6.5	11	11.5	0	0	2	26.8	42	3.5
	6	12	10.8	8	8	4	29	45	4
	5	15	9.8	5	2	4	31.4	38	10
	4	13	9.8	9	2	4	31.7	26	10
19-Jul	4	12	9.9	8	8	4	31.3	25	13
	5	13	10.2	8	8	4	31.5	37	12.5
	6	14	10.3	8	8	4	31.5	46	10
	6.5	16	10.7	0	0	3	29.5	43	4
	7	14	11.2	0	0	3	29.1	44	4
	8	14	11.8	0	0	3	28.9	26	5
20-Jul	8	11	10.8	16	8	3	29.2	27	2
	7	12	11.3	19	2	3	28	44	3
	6.5	12	10.9	20	2	4	29	41	3.5
	6	10	10.1	25	8	4	30.4	44	5
	5	12	9.9	25	1	4	31.5	38	9
	4	12	9.8	25	2	4	31.6	26	7
21-Jul	4	12	10.1	40	8	4	31.5	24	6
	5	12	9.8	35	8	4	31.5	36	5
	6	11	9.8	35	8	4	31.2	47	4.5
	6.5	-1	-1	-1	-1	-1	-1	-1	-1
	7	-1	-1	-1	-1	-1	-1	-1	-1
	8	-1	-1	-1	-1	-1	-1	-1	-1
22-Jul	8	11	10.2	10	6	3	29.1	29	3
	7	11	10.1	5	6	3	29.1	43	3
	6.5	12	10.6	0	0	3	29.7	41	3.5
	6	12	10.3	0	0	3	30.5	43	4
	5	13	9.9	0	0	4	31.1	38	8

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Appendix F. (p 4 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
22-Jul	4	11	9.9	12	8	4	31.5	26	7
23-Jul	4	13	10	0	0	3	31.5	24	8
	5	12	10.5	4	8	2	31.3	34	7
	6	13	10.1	8	8	4	30.9	47	5
	6.5	13	10.3	5	8	4	30.5	43	4
	7	15	10.6	0	0	4	30.1	46	3
	8	14	10.5	7	6	4	29.9	29	4
24-Jul	8	11	10.8	4	6	4	29.2	31	3.5
	7	10	10.6	2	6	1	29.7	45	3.5
	6.5	13	10.3	0	0	3	30.3	44	4.5
	6	12	10.4	10	4	4	30.2	45	5
	5	15	9.6	0	0	4	31.7	33	14.5
	4	14	9.7	0	0	3	31.5	22	11
25-Jul	4	10	9.9	15	4	3	31.3	23	8
	5	10	10.4	15	4	3	30.4	35	5
	6	10	10.4	10	5	4	30.4	44	4
	6.5	11	10.5	5	5	4	30.3	43	4
	7	10	10.9	7	4	4	29.3	45	2.5
	8	10	10.9	5	5	4	29.3	31	3
26-Jul	8	10	10.7	4	1	1	29.4	29	3
	7	10	10.5	4	2	3	30.1	45	4
	6.5	10	10.3	0	0	3	30.5	42	5
	6	10	10.5	4	2	3	30.2	47	4
	5	10	9.7	0	0	3	31.6	34	13.5
	4	10	9.9	0	0	3	31.5	25	10
27-Jul	4	15	10.1	8	5	3	31.6	24	13
	5	15	10	5	4	3	31.6	34	12
	6	14	11.1	13	5	3	29.4	46	4
	6.5	15	12	10	4	3	27.9	41	3
	7	14	12.2	10	6	4	27.9	45	2.5
	8	14	11.1	10	4	4	29.4	28	2
28-Jul	8	12	10.8	5	6	4	29.5	29	3
	7	12	11	0	0	1	29.4	46	3
	6.5	11	10.8	0	0	3	30	43	4
	6	14	10.9	5	4	3	29.9	44	4
	5	13	10.1	12	6	3	31.7	34	15
	4	13	10.1	12	4	3	31.6	24	14
29-Jul	4	15	10.2	10	4	3	31.7	25	12
	5	16	10.1	12	4	3	31.5	35	14
	6	17	11.9	5	4	3	28.6	47	3.5
	6.5	17	11.3	8	6	3	29.3	42	3

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Appendix F. (p 5 of 5)

Date	Station	Air Temp. (c)	Water Temp. (c)	Wind Vel. (knots)	Wind Dir^	Tide Stage~	Salinity (ppt)	Water Depth (f)	Secchi (m)
29-Jul	7	19	12.2	8	4	2	28.3	43	3
	8	19	12.2	5	6	4	28.7	31	4
30-Jul	8	12	11.9	0	0	4	28	30	3
	7	11	11.2	0	0	4	29.8	43	4.5
	6.5	12	10.6	0	0	4	30.8	46	7
	6	12	10	0	0	4	31.6	48	12
	5	12	10.2	0	0	4	31.7	37	14
	4	12	10.4	0	0	3	31.7	24	13

^ Wind direction code 1=north,2=northeast,3=east,4=southeast,
5=south,6=southwest,7=west,8=northwest

~ Tide stage code 1=high,2=low,3=ebb,4=flood